



TECHNOLOGY SOLUTION

Sensors



Detection Of Presence Of Chemical Precursors

[Precursors provide early warning](#)

Certain selected chemicals associated with terrorist activities are too unstable to be prepared in final form. These chemicals are often prepared as precursor components, to be combined at a time immediately preceding the detonation. One example is a liquid explosive, which usually requires an oxidizer, an energy source, and a chemical or physical mechanism to combine the other components. Detection of the oxidizer (e.g. H₂O₂) or the energy source (e.g. nitromethane) is often possible, but must be performed in a short time interval (e.g., 5- 15 seconds) and in an environment with a very small concentration (e.g. 1-100 ppm), because the target chemical(s) is carried in a sealed container.

BENEFITS

- High sensitivity sensors (ppm-ppb)
- Real-time response
- Distinction between multiple-target molecules that may be present
- Energy efficient
- Detects at least one oxidizer and at least one energizer
- One or more target molecules in the gas can be sensed from a single set of measurements



THE TECHNOLOGY

These needs are met by this invention, which provide easy stem and associated method for detecting one or more chemical precursors (components) of a multi-component explosive compound. Different carbon nanotubes (CNTs) are loaded (by doping, impregnation, coating, or other functionalization process) for detecting of different chemical substances that are the chemical precursors, respectively, if these precursors are present in a gas to which the CNTs are exposed. After exposure to the gas, a measured electrical parameter (e.g. voltage or current that correlate to impedance, conductivity, capacitance, inductance, etc.) changes with time and concentration in a predictable manner if a selected chemical precursor is present, and will approach an asymptotic value promptly after exposure to the precursor.

The measured voltage or current are compared with one or more sequence soft heir reference values for one or more known target precursor molecules, and a most probable concentration value is estimated for each one, two, or more target molecules. An error value is computed, based on differences of voltage or current for the measured and reference values, using the most probable concentration values. Where the error value is less than a threshold, the system concludes that the target molecule is likely. Presence of one, two, or more target molecules in the gas can be sensed from a single set of measurements.



The technology provide easy stem and associated method for detecting one or more chemical precursors (components) of a multi-component compound.

APPLICATIONS

The technology has several potential applications:

- Homeland Security and Defense
- Airports
- Chemical processing environments
- Gas Leak detection
- Environmental monitoring

PUBLICATIONS

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National Aeronautics and Space Administration

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